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1922
no 8
Engineering

WILSON. President
W. A. BOOTH Secretary
P. P. REYNOLDS Treasurer

OFFICIAL PROCEEDINGS

Meeting of November, 1922.

Volume XXI.
No. 8.
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INCORPORATED OCTOBER 1913

Canadian Railway Club

MONTREAL

CONTENTS.

REPORT OF NOVEMBER MEETING

and

Paper and Discussion on

"SOME RECENT DEVELOPMENTS IN LOCOMOTIVE CONSTRUCTION"

AUG 1 0 1943

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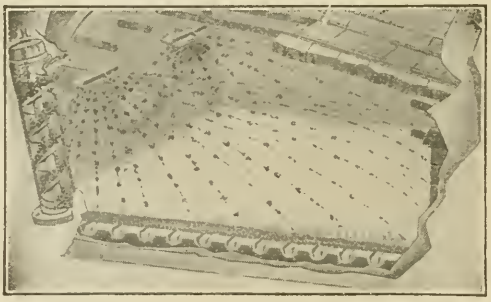

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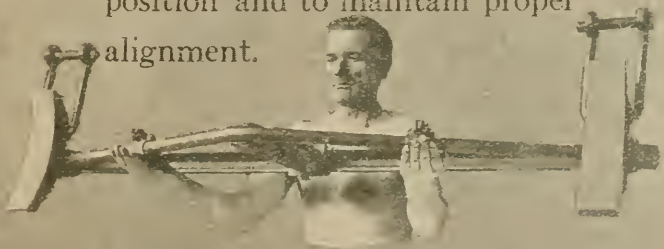

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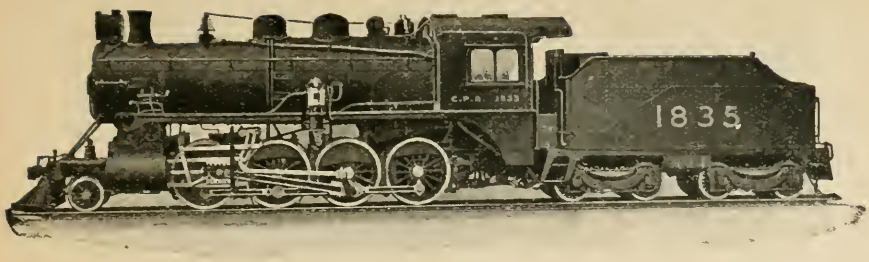

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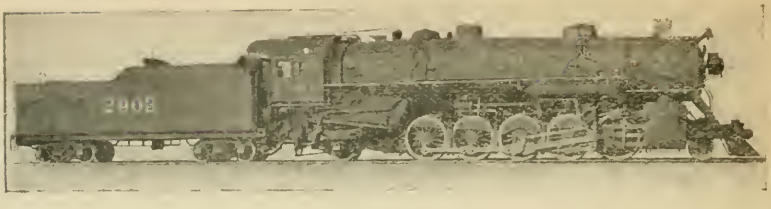

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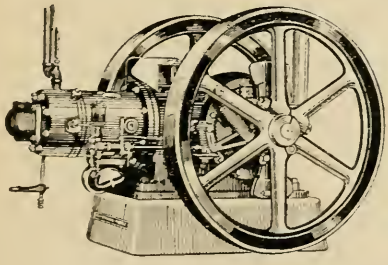

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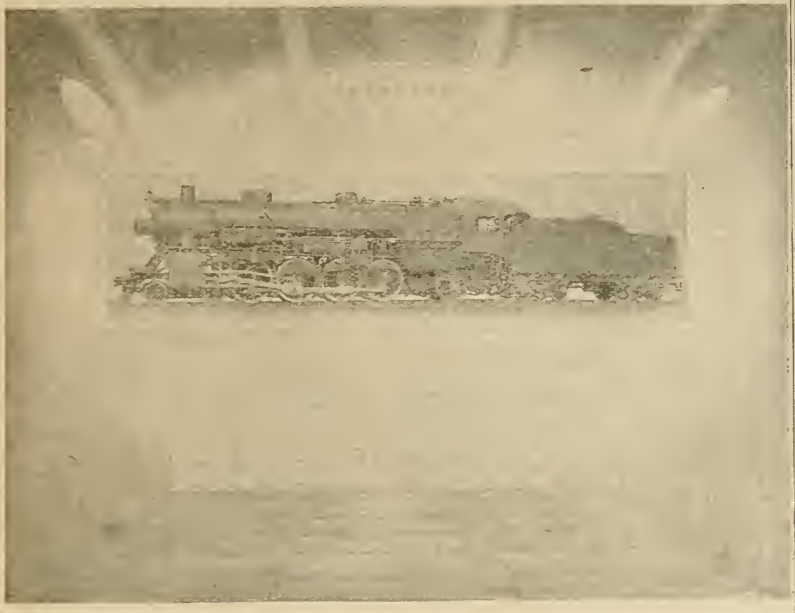

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W. A. BOOTH, Secretary, 53 Rushbrooke Street, Montreal.

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PROCEEDINGS OF THE CANADIAN RAILWAY CLUB

Windsor Hotel, Montreal,
November 14th, 1922

Chairman: (Mr. G. M. Wilson.)

The meeting is now called to order, gentlemen, and before we commence the proceedings this evening, I would ask you all to fill in the attendance cards which you will find on the chairs.

MEMBERS PRESENT

Wilson, G. M.
Allen, C. D.
Angus, D.
Armstrong, H. T.
Armstrong, R.
Arnold, D. R.
Barcley, L. E. W.
Atkinson, F.
Atkinson, F.
Barrett, C. W.
Barry, A. W.
Barton, A.
Bell, H. C.
Bell, V.
Benger, F.
Bermingham, T. C.
Bannerman, W. H.
Besse, R.
Black, R. D.
Branston, W. E.
Branston, W. E.
Bray, A. C.
Broadbent, J. F.
Broaderup, M.
Buckland, A. W.
Buckland, J. W.
Burns, J.
Burns, J. C.
Butler, H. C.
Carrigan, W. J.
Carter, W. J.
Casey, W.
Cave, H. H.
Chenery, W. H.
Chown, T. C.
Clark, W.
Collins, R.
Coleman, J. W.
Coleman, M. T.
Connal, W. F.
Comley, W. T.
Cooper, R. S.
Cowap, W.
Crawford, R.
Crockett, W. B.
Crumpton, A.
Doherty, A.
Dohm, J. T.
Deslieres, M. R.
East, G.
Elliott, W. R.
Fairchild, R. H.
Fellier, F. J.
Ferguson, B. H.
Ferguson, J. P.
Fielding, W. G.
Fierro, W.
Fraser, J.
Gardner, K. V.
Gigandet, H. V.
Gigg, T.
Gill, W. M.
Goodenough, A. J.
Greenough, G.
Harragin, H. C.
Hanson, L. J.
Harrison, J.
Harty, W.
Higgins, G. C.
Hobbs, W. H.
Holland, F. E.
Holland, H. S.
Horn, B. T.
Hudson, T. C.
Inns, G. A.
Jackson, J. R.
Jacques, A.
Jeffries, G.
Jenner, W. C.
King, A.
Kojeski, V. P.
Lachapelle, J .D.
Lane, N.
Lecavalier, A.
Lowe, S.
Lowe, W.
Lowe, W. S.
Lydon, L.
Mackie, R. L. D.
Miles, A.
Milne, D.
Mislap, A. A.
Misson, R. C.
Morozain, J. E.
Muir, J. D.
Mynard, T.
McAvoy, R. L.
McCaffrey, M. P.
McDonald, A.
McHattie, F. W.
McHattie, F.
McLaughlin, G. P.
McNaughton, J.
McNown, W. L.
Naylor, H. R.

Norris, R.
Ogden, J.
Palme, J. E.
Parks, G. E.
Payne, M. J.
Pierpont, F. H.
Primeau, J. L.
Pullen, L. G.
Redmond, W. M.
Reynolds, P.
Richardson, S.
Richmond, E. M.
Robb, Bruce.
Robb, J. D.
Robb, W. D.
Robb, G. W.
Roberts, W. H.
Rose, E.
Rosevear, W. H.
Ross, J.D .
Ross, N. E.
Schellens, E. L.
Scott, R. T.
Scott, W. M.
Seccombe, A. G.
Sharpe, H. W.
Shaw, J. A.
Shortley, B. F.
Simms, A. W.
Simpson, S.
Smith, J. L.
Smith, L. G.
Spalding, E. C.
Spence, J. H.
Spence, W.
Stanger, R.
Stewart, W. H.
Summers, W. S.
Symmes, H. H.
Thomas, E.
Thompson, C. E.
Thorburn, C. D.
Taylor, S. G.
Tinkler, C.
Tinkler, J. E.
Tourville, M.
Van de Wall, L. J.
Walsh, J. J.
Walmsley, W. T.
Warner, G.
Weston, M.
Wheatley, G. H.
Wheatley, J. H.
Whitcomb, F. E. W.
William, J. L.
William, S. F.
Winship, R. B.
Wood, R. J. H.
Woodridge, H. C.
Wye, H.
Young, H. O.
and
Booth, W. A.

Chairman:

As the proceedings of our last meeting have been distributed and no doubt have now been received by all, we will dispense with the reading of them. The Secretary will now read the names of those nominated for membership.

NEW MEMBERS

Beck, W. Material Inspector, Can Nat. Rlys., Montreal.

Bell, V. Depot Agent, Can Nat Express, Montreal.

Bray, A. C. Asst. Foreman, C.P.Rly., Angus Shops, Montreal.

Broom, W. Asst. Foreman C.P.Rly. Angus Shops, Montreal.

Campfield, R. H. 49 Knox St. Montreal.

Gaudion, T. H. Salesman, Can. Firebrick Co. Ltd., Montreal.

Hoyt, C. C. Mgr. Pneu. Tool Sales, Can Ingersoll Rand Co., Montreal

Lenoir, J. R. Inspector, Robt. W. Hunt. Box 287, New Glasgow, N. S.

McCardy, A. M. Asst. Shop Supt., Eastern Car Co., Ltd., New Glasgow, N. S.

Sauve, G. Asst. Foreman, C.P.R., Angus Shops, Montreal.

Skelton, F. Contract Foreman, C.P.R. Angus Shops Montreal.

Stewart, R. A. Shop Supt. Eastern Car Co. New Glasgow, N.S.

Wheatley, G. H. Chief Engr. C.P.R., Windsor Sta. Montreal.

Woodham, S. Eng'r Asst. Montreal Gen'l Hospital, Montreal

Chairman:

You have heard the reading of these names, gentlemen, and, if approved, please signify in the usual manner. (Approved.)

The date of the Annual Banquet is drawing near and we have discussed it somewhat at our executive meeting to-night. It is to be held the last Saturday in January and I would like to get the feeling of the members as regards this banquet. No doubt there will not be very many dissenting voices, as we always have a very enjoyable time when we get together on that occasion. We were considering the advisability of speech making. Personally, I believe no banquet is a success without a speech. A Committee has been formed to look after the details of the Banquet, also a speaker or two, and we will, I am sure, all have a very happy time. And now, to-night we have Mr. Grafton Greenough, Vice-President of the Baldwin Locomotive Works, who is going to address us on the subject of "Recent Developments in Locomotive Construction." It is a very vital subject, and one that is near to the heart of all railway men; it is the most wonderful machine for transporting on land that there is. We view it with pride; we look upon it as our idol, in fact there is scarcely a man in the railway service, no matter in what Department, but views with admiration that machine known as the locomotive. We therefore anticipate an intellectual treat, and will now call upon Mr. Greenough to come forward to the platform.

Mr. President, Fellow Members and Guests of the Canadian Railway Club:

The principal feature of this evening will be the showing of the film record of a notable shipment of twenty 2-10-2 Type Locomotives in one train, popularly known as "THE PROSPERITY SPECIAL," during part of its journey from the Atlantic to the Pacific.

There was a reason for this unique shipment. Apparently unknown to the vast majority of people, commercial activity in the United States had been gradually awakening in healthy fashion during the early months of this year, but it was realized that something unusual was required to awaken in the general public a recognition of the fact that prosperity was on the way and that compared with other parts of the World, particularly Europe, we, in North America were enjoying comforts and luxuries which others would be only too grateful to receive in part. This thought, coupled with the

realization that routine advertising of the products of The Baldwin Locomotive Works from a selfish standpoint would be futile, encouraged Mr. Samuel M. Vauclain to concentrate his endeavors upon the promotion of business in general, because with the advent of general prosperity the Railroads and ultimately the Locomotive Builder must come into their share. The presence at our Works of fifty locomotives awaiting shipping instructions from the Southern Pacific System, offered an opportunity for publicity. It seemed logical that by demonstrating the fact that a railway system on the Pacific Coast was confident enough of the future to order a train load of locomotives a stimulating influence would be created not only in the larger business centers, but in the smaller towns and throughout the countryside the people would be induced to see, talk and think. We knew from experience that shipping one or two locomotives in trains several days apart attracts no particular attention, but we could only surmise the psychological effect of shipping a train load of locomotives. The proposed plan was heartily endorsed by Mr. Julius Kruttschnitt, Chairman of the Board of the Southern Pacific System, and ultimately with the hearty co-operation of all concerned the train started from Eddystone (near Philadelphia), May 26th, and arrived at every stopping point scheduled on time. After reaching Saint Louis over the Pennsylvania Railroad Line, the Saint Louis-Southwestern, affectionately known in its territory as the "Cotton Belt," delivered the train at Corsicana, Texas, to its owners who forwarded it to the Pacific Coast over their own lines—the Southern Pacific Railway.

Fortune rewarded the efforts of those in charge of the train and it arrived without developing a single hot box, in Los Angeles on the morning of July 1st, where it entered the Terminal Yards on one side of the shop as the men who took part in the now historic strike walked out on the other. Throughout the trip the crowds which witnessed its passage were beyond all expectations, and public demonstrations were numerous, impressive and far reaching. In many towns schools were closed so the children could see the train and impressive exercises for the "grown ups," rang in the praise of prosperity.

A recollection of the inevitable comparison brought to mind by seeing one of these modern locomotives standing close to the "C. P. Huntington"—the first locomotive bought by the Southern Pacific System—now on an exhibition track in Sacramento City, directs our thoughts to the theme proposed

by Mr. Booth for this evening's discussion, viz: "Some Recent Developments of the Locomotive Engine."

It is said that when William Penn, the founder of the State in which I live, was summoned before Charles II. so that that Monarch might ascertain from him wherein the Quakers differed in theology from the established Church, William Penn replied, "Sire, the difference is akin to that between our hats; it is largely in the trimmings." So, when you ask the distinctive features of the modern locomotive, I reply—A great deal of the difference between recent practice and that of the pioneers may be attributed to the trimmings, or the accessoriees and specialties with which the modern locomotive is covered. It has been said that a certain popular make of automobile is designed to act as a base for as many accessories as their owners' pocketbooks may permit. I am sure that the designer must have gotten his ideas from the locomotive engine. The "C. P. Huntington" had cylinders 11″ x 15″, weighed in working order 39,000 pounds and exerted a tractive power of 3500 pounds. The modern 2-10-2 has cylinders 29½″ x 32″, weighs with tender 620,000 pounds and its tractive power is twenty-one times greater without the Booster, and its starting effort is twenty-four times greater with the Booster. The locomotive designer and builder have been kept busy providing for the problems constantly confronting them during the transition from the pioneer days of railroading to the present time.

Just as the "trimmings" were not the sole difference between the hats of the "Kingly" Charles and the "Friendly" William, so also much of a substantial nature bridges the gap between old and modern locomotives. We used to cut and try the plates for boilers and the location of rivets and stays was left to the judgment of the "layer-out" in the boiler shop. Now every hole and rivet is located in the Engineering Department, and the sizes of plates are laid out with such accuracy that the riveted boiler is almost water tight before caulking. In modern boiler work we no longer rely upon the drift pin and sledge hammer to correct a refractory fit.

In erecting a locomotive we used to set the frames and cylinders on jacks and in due course they were "lined up" to threads passed centrally through the cylinders. If during the process of erection no one moved the jacks or threads the results proved fairly good. Now, however, the process is started by setting the frames on jigs to which they are securely fastened in line. The cylinders built to gauge are then

fastened to the frames and the boiler, which is also built to gauge, is attached to the frames and cylinders, the saddle of which has already been planed to receive the smokebox. After furnace bearers and crossties are bolted in place the engine, which has been built in line and must remain in line, is ready for wheeling. This method of erecting locomotives was designed by Mr. John P. Sykes, our Senior Vice-President.

Even the tender is modernized to meet the demands incident to carrying from twelve to fifteen thousand gallons of water, and the water tanks are becoming so heavy as to require boiler tools and boiler makers to fabricate them. Cast steel tender frames and six wheeled trucks are not unusual.

In our Drawing Rooms we used to gravely work out by rule of thumb the sizes of the various parts of locomotives and if a failure occurred the erring part was replaced with a "heavier" one, heavier in those days was the vernacular for larger. As increased capacity engines were added to our list of designs an effort was made to increase the sizes of all parts proportionately. But these unscientific ways are no more. The advent of higher boiler pressures and greater demands upon the working parts, together with the variety of designs of locomotives which have been created, brought forward the best efforts of the mathematician in ascertaining the strains incident to the modern locomotive and the determination of what materials must be used and into what shapes they must be formed to resist such strains.

To return to the trimmings:—What modern efficiency could be expected from an enlarged edition of the "C. P. Huntington" were it without tthe air brake to stop it, the injectors to feed the boiler, the stoker to fire it to capacity, and the superheater to save water and coal, together with the hundred and one devices which make the modern locomotive possible within the limits of weights and sizes which constantly threaten to curtail the further growth and power of locomotives.

The evolution of the locomotive has exhibited an adaptation to changing conditions and varying demands such as has been probably imposed upon no other mechanism, and the efforts, skill and patience of those who have contributed to the work has in many instances been rewarded by discouragement and loss. The majority of the improvements which are recognized to-day received scant encouragement when they were first proposed as the well known story of George Westinghouse's efforts will verify. One of the earliest proposed labor

saving devices is the pneumatic fire door. I can remember when its trial was laughed to scorn; for why should not a fireman open and shut the door by hand, and even yet there are those who do not realize the saving effected by releasing the fireman's attention from the detail of eliminating undesirable cold air from the firebox. A close second may be found in the air sander as it was argued, why use air to save an engineer's time, and why save sand—both were cheap.

Every device before recognition as a necessity has fought itsway—first as to practicability—then as to whether some other means could eliminate it, and finally as to economic value. These questions are often difficult to answer because they involve first cost and incident interest from an investment standpoint; the cost of probable repairs, its possible inducement to engine failures on one hand, and on the other, the time the locomotive will remain in service.

Whilst the superheater early demonstrated its ability to save fuel it was many years before the top header pattern from which the tubing was dropped naturally eliminated the prohibitive repairs to the earlier types of superheaters where the tubing entered the headers at various angles other than the perpendicular.

The feed water heater, which is becoming more and more popular, made no progress until improvements were provided for overcoming its tendency to clog up.

The stoker had a hard struggle until the size of locomotives increased to such an extent that their fuel requirements exceeded the capabilities of any fireman. It was only then that we gained the experience which has enabled the manufacturers of stokers to so simplify their products that economy as well as capacity can be relied upon.

The booster is a new comer in the field which has proven the most popular of any of the devices which have recently been designed to temporarily increase the tractive power of locomotives by utilizing what would otherwise be dead weight of engine or tender. It bids fair to supplant auxiliary engines on tenders and mechanism for increasing the weight of drivers.

Some of the things we regard as new are closely related to discarded efforts of the past—the "Southern" Valve Gear is the old Hackworth Gear operated by crank arms instead of eccentrics.

The transverse pockets dropped from the crown sheets of early English coal burning locomotives are the forerunners of the Nicholson Syphon.

Interest in the three cylinder engine is reviving and the Compound is not forgotten.

Sometimes economy of operation is sacrificed to facilitate adjustment and repairs—as when the old Stephenson Link Motion was supplanted by the outside gears.

In addition to determining the design of locomotives and the specialties which may be the most desirable from an abstract standpoint the determination of what combination of design and specialties will meet the conditions under consideration for a given service becomes a matter of personal judgment on the part of the railroad official or officials to whom the lot of deciding upon specifications falls. This judgment is usually exercised by a railroad official or the locomotive designer in adapting to his conditions the information available regarding the record on other roads or under other conditions of the action of each detail of design or specialty under consideration and the ultimate selection of details and specialties to be used is often further influenced by physical limitations such as clearance or allowable weight, and more especially by the limitations as to first cost. The specifications covering many locomotives are therefore compromises wherein the best judgment of those responsible is reflected in the determination of what can best be given up so that something which is deemed more essential may be used, and it is fortunate that the limitations as to first cost appear to be less drastic than formerly because where ultimate saving can be shown those having charge of the finances usually understand that first cost saving is not the best economy. This exercise of thought and judgment as to each particular problem is a good thing because it tends toward maximum efficiency of motive power in a given service.

During the control of the railroads in the United States by the Railroad Administration a determined effort was made to standardize various types of locomotives, but notwithstanding the excellence of the designs of these locomotives from a general standpoint the owners of the railroads upon resuming control without exception returned to the practice of buying locomotives to suit their individual needs. In other words, every railroad company wants locomotives which are one hundred percent efficient for their lines even if they cost a little more money to build. The practice of using locomotives having lower efficiency because they can be manufactured in quantity cheaper is recognized as poor economy. On the other hand, we should strive for such standardization as is reason-

able and practicable, but standardization should not be allowed to bring about stagnation. The modern locomotive has made great progress beyond its predecessors and the wonderful variety of its designs is the result of careful study and the differences of many honest opinions. May the same tendencies prevail so that the locomotive of the future may always be a modern product from the standpoint of the time at which it shall be produced.

Chairman:

I am sure we have all listened with very great interest to Mr. Greenough's talk, and doubtless now that he has taken his seat he would have a little more to say if you gentlemen who are interested in locomotive construction, etc., would ask him a few questions. He stands ready to answer any question you wish to ask. Afterwards we are going to have a moving picture of the "Prosperity Special" of which he made mention in the beginning of his address this evening.

Mr. M. Weston:

Can you explain why our Pacific Type locomotives develop "a pound" more often in the left main driving box than in the right driving box? ,

Mr. G. Greenough:

I think you will find that where such pounds occur exclusively on one side of locomotives on which all conditions are the same on both sides except those due to the quartering of the crank pins, that the tendency to pound is due to the uneven impulse resulting from the fact that the pins on both sides of the locomotives are at times either both ahead or both back of the vertical centers of the drivers and that an unbalanced force is created thereby.

Mr. P. Reynolds:

I would be glad to hear an explanation of what the Booster is.

Mr. G. Greenough:

The Booster is a small independent engine encased in an oil tight frame which is designed to temporarily convert the trailing wheels of locomotives into drivers. The Booster is so attached to the trailing axle that it may be thrown in mesh with a gear attached to the trailing axle at the will of the engineer either while the locomotive is starting or running at low speed. The Booster can also be thrown out of

gear at the will of the engineer or it will automatically disengage after the locomotive has attained sufficient speed for the reverse lever to be hooked up. The meshing and unmeshing of the Booster engine with the gear of the trailing axle is accomplished by means of pneumatic mechanism designed and built by the Westinghouse Air Brake Company. The Booster is controlled by the Franklin Railway Supply Company.

Mr. N. Holland:

Have there been any recent developments in the use of powdered fuel?

Mr. G. Greenough:

Several engineering companies, including the Locomotive Pulverized Fuel Company, hove been making exhaustive studies relative to the possibility of using pulverized fuel in locomotives, and the Delaware & Hudson Railway have been experimenting with a pulverized fuel burning locomotive, and I understand that satisfactory progress has been made. As powdered fuel is being used in industrial plants there is no inherent reason why it should not be used in locomotives. The chief difficulty appears to be the expense of pulverizing and storing the fuel so that it will be kept absolutely dry, but the discouragements due to these difficulties will disappear as coal becomes scarcer and dearer.

J. W. Buckland:

I would like to ask the relative efficiency of the locomotive C. P. Huntington as compared with modern locomotives. In other words, what improvements have been made in recent years?

Mr. G. Greenough:

Your question, as I understand it, would require a long time to answer. In fact my talk of the evening has only partially answered it.

Mr. J. W. Buckland:

I had in mind particularly the question as to the amount of fuel used per unit of tractive power. To what extent have we improved that efficiency since the C. P. Huntington was built?

Mr. G. Greenough:

The C. P. Huntington was equipped with a relatively small boiler, an ordinary firebox without superheater and without fire brick tubes. The boiler was comparatively a tea-kettle from which a pair of cylinders drew wet steam as rapidly as it was generated. Without the opportunity to calculate, I would not be surprised if the C. P. Huntington required twice the amount of fuel per unit of tractive power as would be needed by the modern locomotive for the same unit. It would be impossible to build an enlarged C. P. Huntington having a capacity of the Southern Pacific 2-10-2's within the limits of size and weights which now govern; neither would it be able to handle a modern train on the schedules now prevalent without the air brake. Hence the modern locomotive is an impossibility without the improvements which have been applied to locomotives since the C. P. Huntington was built.

Mr. G. E. Parks:

Can Mr. Greenough give us any particulars relative to the drafting of locomotives by means of an apparatus in the front end other than the exhaust?

Mr. G. Greenough:

Several devices for creating draft of locomotives by means of fans have been designed. One was tried on the Santa Fe System and another on the Burlington System. I understand the difficulty with these systems lies in the fact that whilst inducing the draft the fan also draws the cinders from the fire and in a comparatively short space of time the cinders literally cut the fans to pieces. I am told that in some instances the abrasive action of the cinders destroyed the fans within two or three days.

At this juncture the moving picture demonstration on the "PROSPERITY SPECIAL" was shown and thoroughly enjoyed by all present.

Mr. W. H. Winterrowd:

I am sure that it is the feeling of our club that we are especially indebted to Mr. Greenough for his very able presentation of this most vital subject and for the time involved as well as the distance travelled, and therefore would move a hearty vote of thanks be tendered him.

In a few well chosen remarks our Past President, Mr. T. McHattie, seconded this—and it was carried amidst applause.

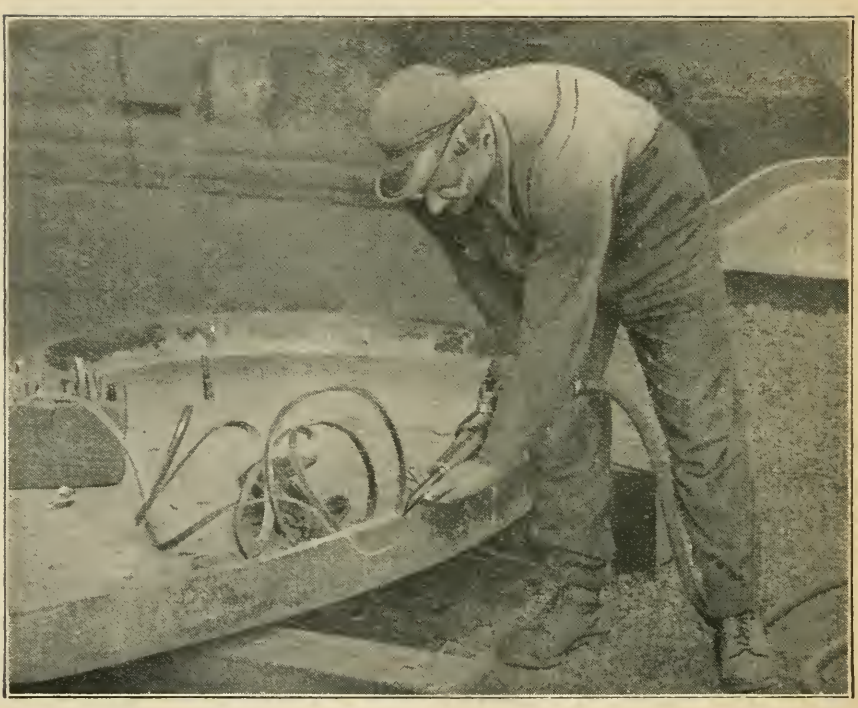
Chairman:

Gentlemen, the subject for our sext meeting, which will be held in this room on December 12th, will be "Some Recent Developments in Car Construction," and will be presented by Mr. E. Viberg, Mechanical Engineer, Canadian Car and Foundry Co.

We appreciate the excellent attendance to-night, and trust you will all be here in December.

Our Secretary informs me that light refreshments will be served in the adjoining room to which you are all invited.

F. P. BRADY
DIED
SEPTEMBER 21st 1922



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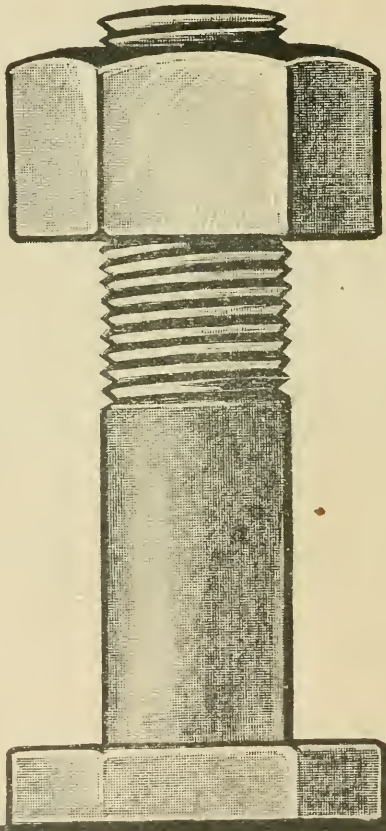

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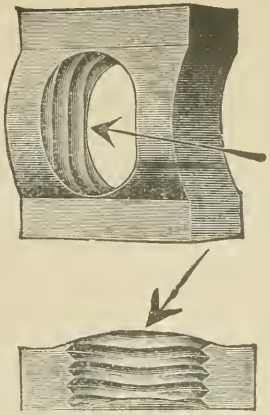

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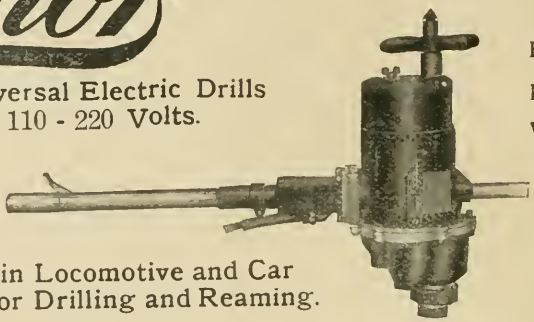

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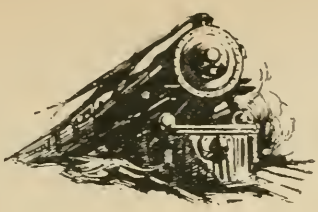

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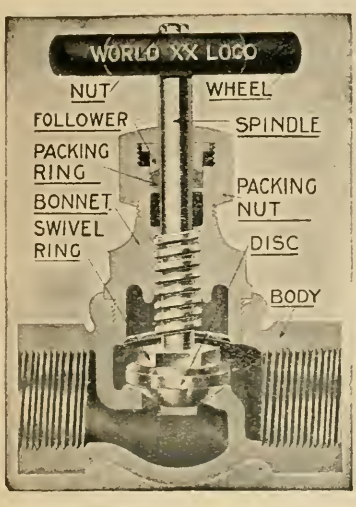

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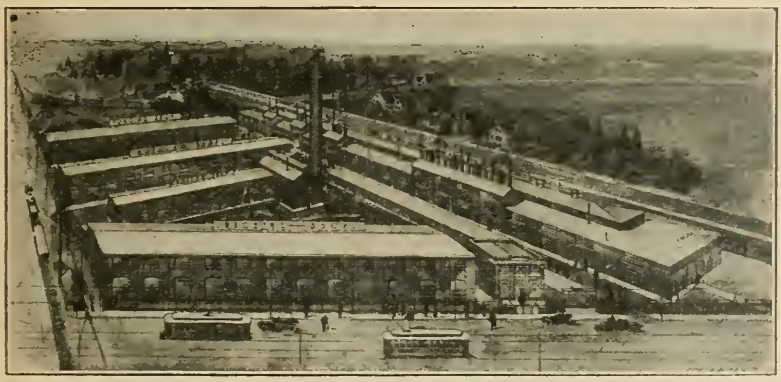

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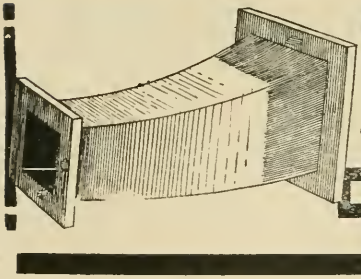

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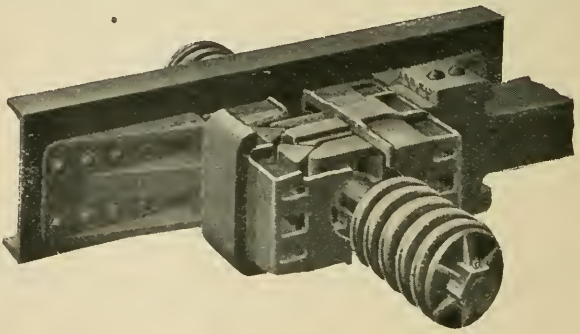

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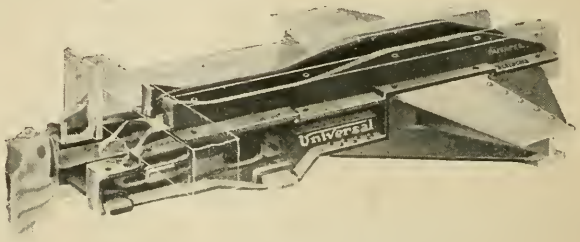

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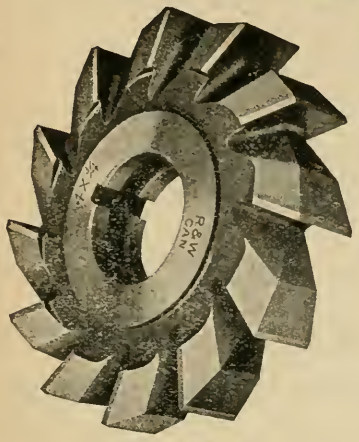

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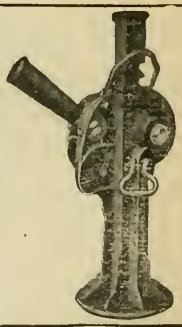

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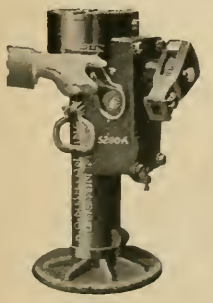

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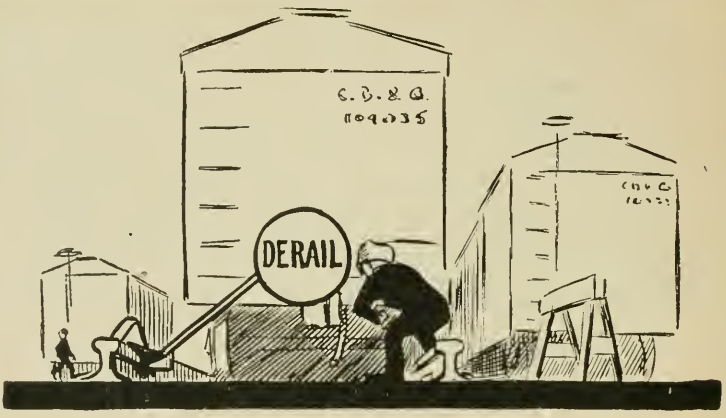

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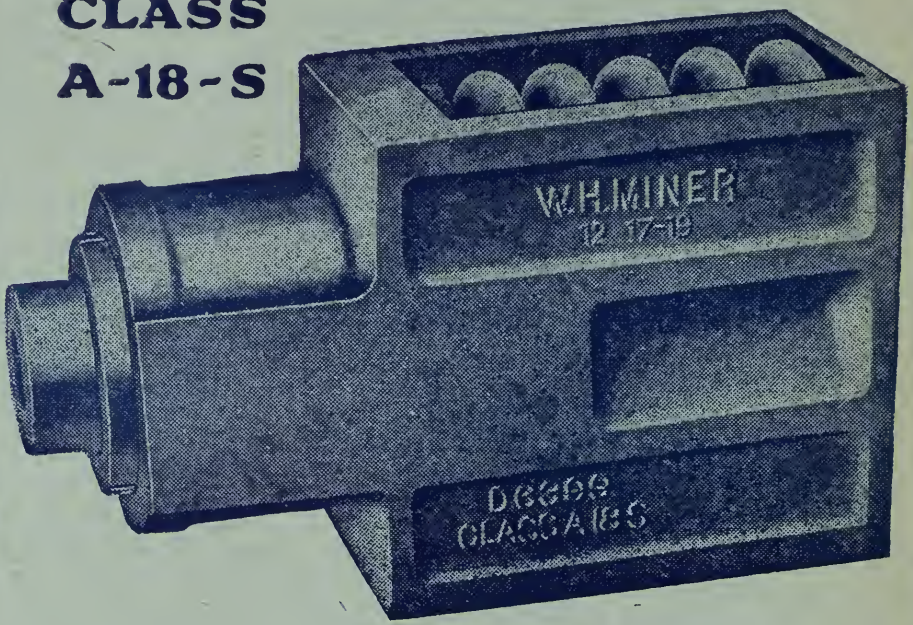

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